

Historical Development of California's Fire Detection System

From the farmer keeping watch while tending his fields to the posting of guards along a fortified city's boundary, fire detection, in its broadest sense, has been going on since time immemorial. But historically, the concern was to protect the "works of man" not the "works of nature." The detection of fires for the purpose of preventing natural resource losses has occurred only within the past 120 years. Before such an endeavor could take place, people had to perceived a need for such a service. More succinctly, there had to be an assumption that suppressing fires within the wilds was both desirable and possible.

Fire detection for the purpose of protecting natural resources began in the United States due to the presence of a frequent fire regime which came into conflict with a rapidly expanding population base. This interaction was accentuated by two particularly harmful practices of the 19th century. First, was the indiscriminate use of fire to clear forested lands for the purpose of establishing homesteads. Second, was the cut-and-run tactics of the logging industry, which left huge tracts of cleared lands in ruin. In their wake, a volatile accumulation of dead fuels ("slash") was created and dense forests of regrowth timber ("weed-wood" as some are apt to say) sprang up. The latter condition often resulted in abnormally high fire intensities when flames revisited the area.

The prevailing attitude that the forests of America were infinite, and infinitely forgiving of mankind's exploits, began waning when newspaper accounts of conflagration fires causing monumental devastation (not to mention the tragic loss of human life) gained widespread attention. This fact, coupled with the realization that America's western frontier was rapidly being settled, elicited a growing concern of an impending "timber famine." The widely circulated theory that the destruction of the forest cover would lead to a sustained drought resulting in the permanent conversion of timber land to desert, accentuated this fear.

During these travails another issue had surfaced; namely, the need to preserve the Nation's natural wonders from privatization. In 1864, the United States Government gifted the Yosemite Grant and Mariposa Grove to the State of California. In 1866, the California State Legislature accepted this land grant. Gaylen Clark was appointed as the first park superintendent. Although it was designated a state park, these grants signaled the beginning of a federal park program.

The advent of a true national park system came with the creation of Yellowstone National Park in 1872. The United States Army was assigned the responsibility to patrol and protect this area. The Army's role included the detection and suppression of wildfire within park boundaries. This was no small task considering

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the size of the park, the crude equipment at hand and the few troops that were assigned. Even though the Army Cavalry was a far cry from the fire profession of today, they nonetheless represented the beginning of a Federal wildland fire protection program. One noteworthy Army idea was the creation of "campgrounds." These were setup as a means to contain the continuing nuisance of abandoned campfires. In 1890, the Sequoia and General Grant Parks, and the Yosemite Forest Preserve were created. The U.S. Army's qualified success in Yellowstone led to the implementation of Cavalry patrols within these parks in 1891.

The formation of national parks addressed the need to "preserve" scenic areas from settlement and exploitation but it had little effect on protecting the Nation's store house of lumber trees. It seemed rather evident that individuals and logging companies could never responsibly manage the Nation's forests on the requisite macro scale. Thus, the argument went, publicly owned forest lands must be protected from unregulated entry and reserved from private ownership. The government would enforce timber harvesting practices upon these lands thereby guaranteeing a perpetual timber supply. The concept to "withdraw" public lands from homestead entry engendered much debate but the private sector's record of waste, indifference and avarice could not go unchecked. In 1891, Congress passed the Forest Reserve Act. The President now had the authorization to permanently withdraw from the public domain, lands he deemed of national importance.

The Act did not, however, specify what constituted "forest" land. The people of Southern California capitalized on this vagueness by successfully lobbying for the creation of the San Gabriel Forest Reserve, a largely brush covered region, whose value lie in its being an important watershed for the Los Angeles Basin. The Sundry Civil Appropriations Act (Organic Act) of 1897 clarified the intent of the Forest Reserve Act and specifically endorsed the validity of watershed protection.

The Department of Agriculture had been established in 1862 but it wasn't until 1875 that Congress allocated \$2,000 to the Department for the purpose of hiring a forestry agent to investigate the subject of timber management. (It should be kept in mind that the discipline of forestry was new and there were few trained foresters.) In 1881, a Division of Forestry was created and in 1889, the Department of Agriculture was raised to Cabinet level status. Meanwhile, all Federal land remained under the control of the Department of Interior, specifically the General Land Office (GLO).

Bernhard Fernow, Division of Forestry Chief from 1886 to 1898, endorsed the creation of forest reserves and pointed out the need to transfer control of these lands from the General Land Office to

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the Department of Agriculture. This would insure that government foresters would have the leverage needed to enforce proper timber management practices. Fernow even drafted an organizational scheme which included the idea that "rangers" would be in charge of the smallest administrative units. But Fernow ran into fierce opposition. While the logging industry, homesteaders and others fought the creation of the reserves, the Department of the Interior stood firm in resisting any efforts to transfer GLO territories to the Department of Agriculture.

Gifford Pinchot is viewed as the "father" of the Forest Service. He served as Chief Forester from 1898 to 1910. His close friendship with President Theodore Roosevelt undoubtedly played a key role in the latter's executive order, of early 1905, which finally transferred the growing collection of Forest Reserves from the Interior Department to the Department of Agriculture. Had he been so inclined Pinchot could have, in all probability, gained control of the federal park lands. But, as a forester, Pinchot's primary concern was the wise commercial use of timber producing lands (utilitarian conservation as opposed to aesthetic preservation). Within a few weeks of Roosevelt's order, Pinchot reorganized the Agriculture Department's Bureau of Forestry into the United States Forest Service (USFS). In 1907, the Forest Reserves were renamed National Forests.

The Forest Service would be the Nation's instrument to implement a timber management plan. Pinchot's philosophy of total exclusion of all fires (except for slash disposal) necessitated the creation of an effective prevention, detection and suppression organization. However, with meager budgets the Forest Service would be severely restricted in the building of a physical plant to carry out its mission. Nonetheless, the construction of California's first two permanent Forest-fire lookout stations took place in 1908.

In 1910, Chief Forester Henry S. Graves, successor to Pinchot, wrote the following:

"The mere fact that a tract is carefully watched makes it safer, because campers, hunters, and others crossing it are less careless on that account. By an efficient supervision most of the unnecessary fires can be prevented, such as those arising from carelessness in clearing land, leaving camp fires, and smoking; from improperly equipped sawmills, locomotives, donkey engines, etc.

"One of the fundamental principles in fire protection is to detect and attack fires in their incipiency. In an unwatched forest a fire may burn for a long time and gain

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great headway before being discovered. In a forest under proper protection there is some one man or corps of men responsible for detecting fires and for attacking them before they have time to do much damage or to develop beyond control."¹

The management of the National Forest system was divided up among District Foresters. The California District (District 5) was headed by Coert duBois. In 1910, duBois worked out the Nation's first fire plan, using the Stanislaus National Forest as a model. The following year, all of California's National Forest had fire plans. An element of these plans was the designation of key mountain tops as permanent lookout points. (The concept of "primary" fire lookouts had been introduced in 1909.) Another significant element of duBois' plan was the codification of the recording of fire statistics. From this information would grow a better understanding of where and why fires occurred.

In 1914, duBois presented his report: "Systematic Fire Protection In The California Forests." The document represents the first in dept, analytical approach to the wildland fire control problem. His treatise laid the foundation upon which subsequent fire policies have been built, and it placed California (i.e. the Forest Service in California) at the forefront of the developing National fire control organization.

Of particular interest to this history was duBois' chapter on fire lookouts. It was here that he penned his endorsement of the construction of 144 square foot (or larger), wood frame "live-in" cabs. Where topography dictated, duBois approved of the construction of Aermotor Company towers (or timber tower equivalents) with "observation-only" cabs. The Aermotor Company had been manufacturing steel windmill towers and military observation towers since the 1890s. Shortly after the turn of the century, they began marketing their military towers for fire control use. But I digress, the point to be made is that duBois was setting the first standards for lookout construction. And, he was also identifying the level of service needed for effective fire protection.

From 1910 onward, the Forest Service made great strides in the building of an infrastructure capable of carrying out both a timber management and a fire control program. In 1917, duBois reported that during 1916 the Forest Service had constructed 227 miles of new road, 1,975 miles of trails, 2,124 miles of telephone lines, 89 miles of fire lines, 81 lookout structures, 40 bridges, 222 miles of fencing, 17 corrals and 202 water improvements. In addition to this, 545 dwellings, barns and other structures had been erected. For the State of California, at least, the protection of the Nation's natural resources was becoming a reality.

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It must be clarified, though, that lands lying outside of Federal ownership were still receiving little in the way of fire protection. California's first Board of Forestry had been created in 1885. While it had become apparent that California needed some sort of timber management program and wildland fire protection plan, political squabbling, funding constraints and the popularity of "light-burning" (i.e. open range land burning) conspired against the Board. The problems associated with the State's administration of the Yosemite Grant did little to help the situation. In 1893, the Board of Forestry was abolished. Round one had ended but the fight was far from over.

At the beginning of the 20th century a few loosely organized groups, and at least one logging company had taken steps to bring about wildland fire protection upon a few scattered properties outside of the Federal lands. In-point-of-fact, the Diamond Match Company may very well have established the first permanent fire lookout station in California when, in 1904, the logging firm erected a building upon Bald Mountain in Butte County. But most of the State remained unprotected.

1905 saw the birth of a new California Board of Forestry. The Board appointed E. T. Allen, an Assistant Forester in the Forest Service, as California's first State Forester. Unfortunately, Allen had to leave office the following year (for personal reasons). His position, not surprisingly, was filled by another Forest Service employee, Gerard B. Lull. After all, the Forest Service was the only source for qualified foresters. In passing, it might be mentioned that 1906 was also the year that the State Legislature returned the Yosemite Grant and Mariposa Grove to the Federal Government.

In the years to come, the State Forester was engrossed in the business of meeting with logging industry representatives, cattleman's associations, politicians and others in order to gather support for the adoption of timber management policies and fire protection programs upon the lands of California (falling outside the National Forest system). The State Legislature, however, was not yet inclined to finance a forestry department nor were they willing to build a wildland protection force. In 1911, Congress passed the Weeks Act which provided for matching funds to states that qualified. Of particular interest was the fact that Congress had authorized Federal aid for cooperative fire protection work. California would not avail itself to this program until 1919.

In juxtaposition to the State's slowly evolving forestry program was the Forest Service's advancement. Besides an ongoing capital improvement program, the agency had immersed itself in a number of studies focusing on the problem of wildland fire control. Fire behavior among various fuel types, the effectiveness of light-

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burning and the general use of control fires in forest management were but some of the issues being tackled. The Forest Service had also commenced mapping the state's vegetation zones and the National Forests continued the compilation of annual fire statistics.

Germane to this history, was the Forest Service's initiation of visibility mapping of the seen areas around existing and proposed lookout stations. These maps were correlated with fire occurrence zone maps to determine the effectiveness and/or significance of a given detection point. During the 1920s additional research into the fire detection system revealed that fire lookouts could be expected to reliably detect smokes within a 15 mile radius of the observation point and that detection should occur within 15 minutes of fire ignition to effect a reasonable chance for rapid fire control.

These, and other findings, were giving credence to the growing suspicion that the existing fire detection system was inadequate. In addition to relatively large fires going undetected, federal fire control officers saw an inherent weakness in not having a cooperative lookout network between adjacent National Forests. Furthermore, many non-Forest lands were left totally in the blind.

A leading advocate for a statewide detection system was Stuart B. Show. He became the California District Forester in 1927. In 1930, Show formed an investigative group at the California Forest and Range Experiment Station (Pacific Southwest today) to scrutinize every aspect of the detection problem. The group, headed by Edward I. Kotok, left no stone unturned. From structure design to psychological testing of lookout operators, their findings poured forth. The final recommendation: California needed an integrated, network of lookouts from the Oregon border to the Mexican line to insure rapid and accurate fire discovery. Many lookouts were already in place but Kotok's group reported a pressing need to build still more stations, replace existing buildings and abandon deficient sites. The means to undertake such an extensive building program would soon be forthcoming.

Before addressing what those means were, we need to review certain state-level activities of the 1920s. In 1921, Merritt B. Pratt was appointed to the post of State Forester. It was during this year that the Stockmen's Protective Association of Alameda and San Joaquin counties erected a lookout building on Mount Oso in western Stanislaus County. The facility was turned over to the State and marked the beginning of California's own State-run detection program. In the following year, Mount Bielawski Fire Lookout Station was constructed using State Funds. This station, located in Santa Cruz County, was considered by Pratt as the first official State lookout. In the Ninth Biennial Report to the State

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Board of Forestry, Pratt reported:

"The first lookout tower on Mount Bielawski, the highest point on Castle Rock Ridge between Santa Clara and Santa Cruz counties, is the first structure of its kind which has been erected through the efforts of the State Board of Forestry. This 60-foot steel tower, and the 18 miles of telephone line connecting it with the California Redwood Park in Big Basin, was made possible through financial cooperation extended by Santa Cruz, Santa Clara and San Mateo counties, the State Highway Commission and the California Redwood Park Commission. There is also a connection with the Los Gatos telephone line which was made by a three-mile line built by local ranchers in co-operation with the State Board of Forestry.

"The telephone line to the California Redwood Park was constructed and the lookout tower erected by state rangers under the supervision of Inspector Frost, State Board of Forestry. On July 2, 1922, the tower was dedicated."²

Of the dedication ceremony, Pratt quoted from the Santa Cruz Sentinel this account of the affair:

"Sunday afternoon before an assembly of about 250 people on Mount Bielawski, a new 60-foot steel tower was dedicated.

"The ceremonies were simple but impressive. Mr. Sanders, the well-known public spirited citizen of Saratoga, was master of ceremonies. There were also present a large number of people from the surrounding districts in Santa Cruz and Santa Clara counties.

"At the command of Mr. Sanders, the Santa Cruz Boy Scout Troop No. 3 opened the ceremonies, Scout G. Penniman sounding the bugle call, immediately following which the flag was raised by Scout Donald Rogers, the other Scouts forming a hollow square. No sooner had Old Glory reached the new high point than Scout J. Sowder, who by then had perched himself well up in the tower, wig-wagged the following message to the people and the rest of the Scouts assembled below:

"'We dedicate this tower to the conservation of our Santa Cruz forests, which we have learned to love for the beauty, the joy and the wealth they give us.'

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"State Forester M. B. Pratt was next introduced. He made some very interesting and prophetic remarks on the usefulness of this fire lookout station system, which his office will establish in this state. This being the first one of these projects, Santa Cruz County may consider itself fortunate and honored. He explained how this tower was made possible by the co-operation of the three counties of Santa Cruz, Santa Clara and San Mateo. He praised the foresightedness of the supervisors in these three counties. Henceforth the state will assume full control of that tower, keeping there a constant guard. The tower is connected by means of a telephone line to the outside world. Mr. Smead, a local resident, will act as guard. Mr. Pratt made special mention of the generosity of Mrs. Smead, who turned over to the state a 99-year lease at \$1 per year to over an acre of ground.

"State Senator Jones followed, giving a very interesting review of the history of the conservation movement in the Santa Cruz Mountains. How the necessary appropriations were secured from the state for what was up to last year the only state-owned park. Mr. Jones made the interesting remark that within 50 miles of this state redwood park was found one-third the population of the state. This valuable asset, he stated, is worthy of the best care that could be bestowed upon it.

"Chairman Rostrom of the Santa Cruz board of supervisors expressed his warm appreciation over what had been done. He mentioned the fact that in previous years it had always been very difficult to secure exact information as to the location of fires; that this system just established would undoubtedly give some much needed information and would therefore be a valuable asset."³

Despite the pomp and circumstances attendant to the opening of the State's first fire lookout station, progress proved to be painfully slow for State Forester Pratt, as he continued to struggle with spartan budgets. In 1923, the State's forestry program supported 16 rangers, four inspectors and two lookouts. However, by 1927 the force was up to 28 rangers, seven inspectors, six patrolmen and nine lookouts. During the interim, Congress had superseded the Weeks Act with the Clarke-McNary Act (of 1924). The law greatly expanded federal assistance to state forestry programs, and California was availing itself to this funding source.

In 1927, Governor Clement Calhoun Young orchestrated a general reorganization of State government, creating the Department of Natural Resources with a Division of Forestry. The California Division of Forestry (CDF) was to be headed by the State Forester.

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The mechanism was now in place for the State of California to begin building a premier wildland fire protection agency. Suppression crew forces increased and more fire stations were erected. Of particular interest was the fact that from 1927 until 1933 an additional 20 or so lookout stations were founded. Although many of these lookouts were "cooperative" projects with the Forest Service, California was, at last, providing fire detection and protection for many of the territories falling outside the Forest Service system.

The Great Depression had a profound impact on both State and Federal wildland fire protection. In 1931, California organized the State Emergency Relief Administration (SERA). Its task was to establish work camps across the State. This labor force would then be assigned various public works projects. However, before the SERA program got very far, the Federal Government stepped in with its own program. It's quite possible that the SERA program was the primary inspiration for President Franklin Roosevelt's Civilian Conservation Corps (CCC). No matter, the net result was the creation of a Nation-wide labor pool assigned to perform conservation works for the benefit of the people of America.

Show and Kotok seemed to have anticipated that a Federal relief program was in the works for when the CCCs were organized the California District of the Forest Service had plans in hand and goals in mind to effectively use this new labor pool. Using Emergency Conservation Work (ECW) funds, the CCCs were to be utilized in accomplishing three basic work projects: firebreak construction, lookout station building, and general improvements. The "Three Cs" would cut fuelbreaks around the State, with particular emphasis on establishing the "Ponderosa Way Firebreak." This continuous fuelbreak extended the length of the Sierra Nevada Mountains, and into the Cascades, ending north of Redding. The firebreak was intended to be a permanent defensive line between the lower foothill regions and the higher elevation National Forest lands. The second project, construction of an integrated, statewide fire detection network would bring to fruition the recommendations of Kotok's investigative group. The third task, general improvements, included the building of administrative and fire suppression bases, installation of roads, bridges, telephone lines and innumerable other conservation projects.

In his report to the Director of the Department of Natural Resources of January 1935, Pratt commented upon the fire detection program as follows:

"In the good old days of the Federal and State Forest Service in California the number of lookout stations built was regulated more by a cramped budget than by necessity. When money was available for a new lookout the

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local ranger would mount his horse, ascend the highest peak in his domain, and proclaim to the few people who cared, 'Let's build her here'.

"With the advent of the Emergency Conservation Fund a serious plan of detection was made possible.

"Fortunately, the Shasta National Forest had been used as a field laboratory in fire control for several previous years. One phase of control that had received its share of study was fire detection.

"The California Forest Experiment Station, and specifically, George M. Gowen, with his staff, had brought out several vital facts through research and experimentation. These men could prove that 95% of all fires reported by lookouts were within a fifteen mile radius of the lookout. They showed that 'discovery time' - (elapsed time between start of fire and detection) was longer than had been suspected, thereby sounding a warning against deep 'blinds'.

"Their technique of developing a detection system was brought out at two ten-day schools held in April of 1933 at Mt. Shasta. A young technical assistant from each National Forest attended as well as a dozen boys just out of forest school, who were later employed in the field. National Parks, County Foresters, and the State Forester sent representatives.

"The most efficient methods of mapping visible area from any peak were studied. Relief models were prepared to show by direct light just how land forms obstruct view...

"The underlying principle in detection planning is to concentrate on the area where most fires occur. This principle is varied somewhat in the case of the Division of Forestry, wherein land values are weighted against the zones of high fire occurrence. The Federal Service is content to furnish additional suppression strength in valuable areas while they adhere strictly to the theory that detection must be based on fire occurrence. However, it must be remembered that incendiary outbreaks, so prevalent in State Forestry records, are of a shifting nature.

"Let us assume that we are to construct a scheme of lookouts in a certain region... Our first step is to determine every single observation point that has a possibility of becoming a lookout and to obtain a

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[visibility] map for each point. This last requirement was a most difficult task in some parts of California.

"Field mapping crews of two men are sent out to map visible area from each point."

"In the meantime, office records are searched and fire reports for the last ten years are brought out. Fires for each cause are 'spotted' separately in their proper place of occurrence on a master map of the unit under consideration. After this 'spotting,' fire groups of approximate equal intensity are arbitrarily blocked out into individual groups. The reason for segregating causes now becomes apparent. 'Camper' fires will be limited to a narrow zone of campsites, and railroad fires will be likewise confined. Then, too, the cause of certain fires may have been naturally removed, so that these fires can be disregarded. Lightning and incendiary fires may be loosely zoned (grouped) since their origin is not closely limited in distribution. The resultant zones of origin are now superimposed and a master grouping of fire occurrence spots is constructed from the composition.

"Now each spot group is planimetered to determine its size, and each internal fire is counted. Thus we establish a 'fire per acre' intensity for each group or zone.

"We may now say that a zone wherein occurs .5 to 1.5 fires per 10,000 acres per year is a zone of low fire occurrence intensity but a zone of 4.5 (and over) fires per 10,000 acres per year is our highest extreme. If an arbitrary limit is thus set for intensity groups we may apply a significant color to each group and there we have a map with splotches of color representing our past 'fire business'.

"In theory future fires will occur approximately where past fires have occurred and this seems to follow in fact, not excepting lightning fires.

"Our next step is to make a tracing of each visibility map. Then each tracing is individually superimposed over the 'fire business' map in its proper place and the area of each particular intensity zone visible from the proposed lookout is recorded...

"...the number of lookouts proposed for the State Division of Forestry has been doubled as a result of the [Forest Service] study. Coverage is still thin but we

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have on record visibility maps for nearly two hundred peaks and we are in a position to fill in blind spaces when the proper time comes.

"Of great importance is the fact that we now have sound justification for each lookout station expenditure."⁴

The CCC program lasted from 1933 to 1942. When it ended, the Three Cs had constructed over 300 lookout towers and houses, some 9,000 miles of telephone lines, 1,161,921 miles of roads and trails and erected numerous fire stations and administrative buildings. The CCCs had also planted over 30 million trees and had spent nearly one million "man days" in fire prevention and suppression activity. Because the CCCs were expected to fight forest fires, they constituted the single largest wildland suppression force ever assembled in American history. Pinchot's dream of total fire exclusion had become a reality.

For the Forest Service, their existing physical plant had been renovated, improved and greatly expanded. For the California Division of Forestry, a system of fire stations and lookouts now existed throughout most of the fire prone areas of California. The Forest Service had identified about 60 sites for the CDF detection system. Approximately 50 new lookouts were erected by the CCCs for the California Division of Forestry. At least 30 of these stations were on sites previously not utilized by the State agency. Most of these lookouts were erected from 1934 to 1936.

While the dust was settling upon this vast array of new facilities, events were transpiring that would elevate the fire detection system to a new level of responsibility. Back tracking for a moment, in 1920 Congress had passed the National Defense Act which called for a reorganization of the U.S. Army command system. An offshoot of this was the eventual creation of the General Headquarters (GHQ) Air Force (in 1935). It was the GHQ which established the Aircraft Warning Service (AWS). Starting in 1937, California lookout operators were trained and tested in the art of spotting aircraft. Sometimes referred to as the "Aircraft Warning System," this pilot program soon spread along the entire West Coast. By 1941 it had expanded across the Nation.

With the surprise attack upon Pearl Harbor, the AWS went on war status. Observers were rushed to their respective posts. The U.S. Army had delegated to the Forest Service the responsibility of seeing to it that all lookouts (Federal, State and local) were in readiness. Contingency plans called for the winterizing of existing lookout stations and the erection of scores of temporary cabins at other strategic locations. (The fire detection plan for California allowed for distances between neighboring lookouts of nearly 30 miles but the AWS program specified spotters every 12 miles or

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less.)

Even at many of the established lookout stations, small cabins were built to accommodate the requisite two observers. These men and women were required to maintain around-the-clock vigilance. While one slept, the other continuously scanned the skies for enemy aircraft. Telephone lines were kept in good repair. During the winter months food supplies and support equipment were either air dropped or hauled in by snow cat to the sequester spotting crews. Every fire lookout in the State played a part in the AWS program.

By 1944 the threat to the continental United States had abated to the point that many stations were closed. The AWS program ceased in 1945. However, in 1951 the Governors of California, Oregon and Washington called for the establishment of a "Ground Observer Corps" (GOC). Apparently, they were responding to growing concerns about the possible effects of the emerging Korean Conflict. The GOC lasted until 1958, never attaining the same level of urgency that the AWS program had.

In reflecting upon the events of the 1930s to the 1950s, we see that a remarkable amount of change had taken place. The CCCs had brought about the single greatest leap forward in the building of an infrastructure for the California Division of Forestry. World War Two and California's robust post-war economy insured that CDF would staff and maintain this newly acquired fire protection plant. California was now inextricably in the business of wildland fire control. But, CDF had not just grown in size, it was growing in stature as well. Testimony to this was the changing relationship between CDF and the Forest Service.

The Forest Service was the first to call attention to the "urban interface" problem, which occurs when wildland fires cross from undeveloped lands into clearly defined urban areas. Because this was primarily a State-level dilemma and recognizing CDF's new role in combating urban-wildland interface fires, the Forest Service invited CDF in as a co-equal to study the problem. The Forest Service, no longer sole provider of wildland fire protection, was, perhaps, now acknowledging that they were no longer the sole source for fire expertise either.

Post-war California was blessed with two of the largest and best equipped fire fighting forces in the world: the United States Forest Service and the California Division of Forestry. In addition to this, other agencies had evolved. The National Park Service and the Bureau of Land Management were two additional Federal agencies now marshalling wildland fire control resources. Meanwhile, local agencies were continuing to emerge and/or improve their capabilities. Of particular interest is the historical record of Los Angeles County. In 1911, the County started their own forestry

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program. During the 1920s, they commenced the building of their own county-wide fire lookout system. The County has continued in its commitment to maintain an adequate level of wildland fire protection. But changes in the size and scope of local, State and Federal wildland fire protection did not equate into an increasing role for fire lookout stations.

The apex of activity for the statewide fire lookout system was reached during the 1940s and early 1950s. After this time, a steady decline in the number of operating lookouts took hold. The reasons were many and varied but can basically be lumped into three categories: demographics, technological change and budget constraints. California's population increase has traditionally been cited as the primary cause for fire lookout closure. There are several factors involved.

Back in the early 1940s, fire control officers in the National Forests of Southern California had called attention to the fact that the general public often reported fires faster and with greater frequency than the surrounding lookout stations. With the influx of more people had come the increased likelihood that a fire would be discovered by a roving citizen. But these officers had more to add. The degradation of air quality in the Los Angeles Basin was interfering with the performance of the fire lookout stations. Unfortunately, the height of the fire season coincided with the worst periods of smog. Simply put, lookout operators could not see the smokes for the haze.

Demographic change was also having a direct impact on the native fuel bed. Specifically, lands once covered in indigenous vegetation had been converted into farmland. Still more lands were being converted into cities and suburbs. Improving and expanding transportation networks were carving up yet more areas. And, of course, more people were living within the forested regions, exerting additional developmental impacts. These factors came to play first in Southern California. And, it was here that the first significant number of lookouts were closed, not long after the end of World War Two.

As for technology, it revolutionize the way wildland fire would be fought. To capitalize upon this, the Forest Service redirected its emphasis away from detection and towards improving suppression force effectiveness. Borate Bombers (precursors to today's fire retardant, air tankers) were introduced. Smoke jumpers and helitack crews came into vogue. The use of heavy equipment for line construction increased. (Mechanized line construction had occurred prior to World War Two but the war effort had elicited a tremendous leap forward in the reliability and durability of tractors and related equipment.) These factors along with new and improved hand tools and fire trucks, plus a better transportation

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system, were reducing both response time to a fire incident and the time needed to effect perimeter control of a fire. As a result, remote guard stations and secondary fire lookouts appeared to no longer be an essential ingredient in the fire plan.

The causality of adverse fiscal impacts upon California's lookout stations is a far more complicated topic to analyze. As alluded to earlier, the apex of capitol improvement expansion (for both the Forest Service and the California Department of Forestry) occurred during the ECW program. More to the point, as the emphasis on fire detection by lookouts has decreased budget allocations for maintenance and operation of the existing infrastructure has been reduced. The Forest Service detection system reflects this change to a far greater degree than the State system. This is because CDF maintained a fairly aggressive facility upkeep and replacement program from the 1940s until the end of the 1970s. As a result, many of CDF's CCC era lookouts are either greatly remodeled or gone. However, within the past decade neither the Forest Service nor CDF have been recipients of significant operational budget increases. But costs continue to climb. Consequently, cuts in the level of service being provided have been made, and fire lookouts are generally the first to go upon the "chopping block."

Actually, within the past thirty years, fire management organization costs have increased markedly, as have suppression costs and resource losses. It should be pointed out, though, that increased funding for presuppression and suppression has not reduced resource losses. For example, of the five worst structure loss fires in State history, four have occurred within the last thirty years. And, of the five largest forest fires to have occurred this century (in the State) four of those occurred within the past twenty years.

Part of this is attributable to the evolution of Southern California's dangerous urban interface problem into the far more serious, and logistically difficult, "intermix" problem. In essence, the lines between the wildlands and urban areas have blurred. Structures and small communities are now scattered throughout much of California's natural resource areas. The effects upon suppression tactics has been dramatic. Prior to the 1970s, fire protection agencies could generally commit all their fire suppression resources for perimeter control of a fire, today this is not the case. As an example, three out of every five fire engines responding to a given wildland fire may actually end up deployed strictly for structure protection. And it is this change in control strategy that is contributing to greater acreage being burned, increased suppression costs as well as forcing critical resource "draw-downs" during active fire periods.

An increasing population base has not only meant a greater

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number of people and structures to protect from the effects of fire it also equates into a greater potential for fire starts. Yet it is the population base increase, that has been the catalyst for lookout station attrition. By 1987, California's collection of fire lookout stations had diminished to under 300. Less than 200 of these were still considered primary lookouts deserving of annual funding.

The last 140 years of human activity induced fuel modification in California has dramatically elevated the volatility of the wildland fuel bed. The last 80 years of adherence to the fire exclusion policy has generated unprecedented fuel loading conditions across the State. Environmental degradation and the last six years of drought has created the largest accumulation of dead and dying fuels ever recorded. Heavy winter rains will not provide the answer. Rains do not stop California's cyclical fire seasons, periodic heat waves, lightning sieges nor do they interrupt the foehn wind phenomena. And, I might add, these last three climatic factors had weighed heavily on the minds of Kotok's investigative group when they designed California's fixed point fire detection system.

Their concern was not how many fires a lookout reported nor who was first to discover a fire, they had one objective in mind: design a fire detection system that guaranteed all potentially threatening fires would be discovered within 15 minutes of their incipency. For as Henry Graves had put it so long ago: "One of the fundamental principles in fire protection is to detect and attack fires in their incipency ...before they have time to do much damage or to develop beyond control."⁵ Today, California does not possess a fire lookout network capable of meeting this goal.

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To this point, our history has addressed only the general development of wildland fire protection in California. Many milestones, admittedly, have been glossed over. The establishment of a national forest and national park system took many years. The enlistment of the State of California into the cause of conservation took even longer. And much could be said about the arduous and sometimes painful chore that was attendant to the building of a physical plant. Prior to the ECW programs, the State Forester and his handful of assistants had to beg, borrow and, well let's say be very creative in how they obtained money and materials for the construction of a lookout station. With the arrival of the Three Cs, the State fell into the possession of a fine collection of detection facilities. But who was the architect and why were these buildings designed in the way they were?

I suppose for many, fire lookout stations seem to look all the same but there are differences. However, before entering a discussion about the buildings, we might do well to digress for a moment and consider the people that occupy these facilities. The general public has been known to perceive that being a lookout is a lonely job suitable to hermits, introverts or eccentrics. But, alas, they are far from right. You'll remember that I mentioned that Kotok's investigative group conducted, among other things, psychological testing of lookout operators. What they discovered was that the best operators tended to be college educated, well adjusted and extroverted. Not all that surprising, in retrospect.

Lookout operators were, historically speaking, expected to understand fire behavior, smoke characteristics, weather patterns and have a functioning knowledge of the fire control organization. They were also expected to have an intimate understanding of the territory under their watch and be able to quickly locate on a map the origin of a smoke column. From the 1930s onward, daily weather observations became an additional requisite of their job.

To live in relative isolation for up to 6 months out of the year means one must be able to live with oneself. It also carries with it the responsibility of taking care of all your daily needs. Even today, many lookouts live a far more spartan life-style than most are accustomed too. And if something breaks, they often must call upon their own resources to effect a cure.

As for extroversion, few people find themselves in a career in which their work station and living quarters are one in the same. Fewer still live in "glass bowls." And for many lookout operators, a steady stream of visitors keeps them in constant touch with the "civilized" world. The number of people visiting a given site can range from less than a dozen to quite literally thousands over the course of the fire season. Indeed, operators may "entertain" more "company" during one summer than most Americans invite into their

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homes over an entire lifetime. Suffice to say, lookout operators are a special kind of people who have risen to meet the challenges of their profession and have repeatedly demonstrated their worth. They are the sentinels of the forest, the first line of defense in guarding the State's natural resource areas from fire. In essence, they are the eyes of the fire control organization and their accommodations must be carefully designed to facilitate continuous, accurate and rapid smoke detection.

So, what about those little buildings with the "million dollar views"? As touched upon earlier, the Aermotor Company was the first widely known firm to market observation towers for fire control purposes. Other companies soon followed but Aermotor remained the most prolific producer of this kind of lookout type. The towers were durable and, when disassembled, could be shipped almost anywhere. But observation-only lookouts were not the tower design of choice, at least not for the Forest Service of California. Actually, there are three basic types of lookout structures: "observation-only", "live-in" cab and "cupola" buildings. We'll turn our attention to the live-in cab, specifically to the genesis of this structure type. In Robert Harvey Abbey's accounts of his experiences in the Forest Service we read the following:

"At Red Bluff, during the winter of 1911-12, 2 lookout houses were made and set up temporarily to see what they looked like. They were made collapsible so they could be packed either by man or pack animal to the high points on the mountain that was chosen for the lookout house station. Light lumber, preferably shiplap for siding, 2 x 4 for studding and frame work. The longest pieces in the whole structure were the rafters, 9 feet. When the house was set up it was 10 x 10 in size. The walls were about 4 feet in height; 8 feet to the eaves. Glass windows filled the balance of space." ⁶

District Forester duBois built upon the Red Bluff idea for we saw that in his 1914 report, "Systematic Fire Protection In The California Forests" he had endorsed the use of a 144 square foot (or larger), live-in cab design (wherever an Aermotor tower was not needed).

Three years later, duBois presented "Plan Number 4-A, PRIMARY LOOKOUT BUILDING, Standard for District 5."⁷ The building plans supplanted the earlier live-in cab designs with a slightly more spacious 156 square foot floor plan. It still employed the technique of modular construction for easing the transportation of the materials to rugged sites. The 4A plan also reflected duBois' concern for efficiency and reliability in fire detection. This live-in cab was so designed that all, or nearly all, of the lookout operator's equipment and creature comforts could be centered around

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the firefinder. This would effectively maximized the number of hours that the lookout operator remained in direct line-of-sight of the detection point's seen area. In the case of the observation-only tower, fire detection would be suspended during meal breaks and after hours, when the operator had retired to the residence below. The live-in cab was just that, a place for the operator to "live in" during the course of the fire season.

The other building type, cupolas had the same inherent weakness that the observation-only towers incurred. So it was, that live-in cabs became the design preference for California detection sites. However, until the advent of an integrated, statewide detection plan, a wide variety of building designs continued to make their way to many a mountain top. The vast majority of these early day lookout facilities would be demolished during the 1930s. Their replacements were specified by the Forest Service, which administered the ECW program. The actual architectural work was contracted out to a private firm in San Francisco. The net result was the acceptance of two lookout types: observation-only towers with associated residences, and live-in cabs.

The observation-only towers were, basically, the Aermotor Company products. The use of these towers was restricted to those few sites in the State which, due to topographic conditions, necessitated the erection of an observation deck greater than 30 feet above the ground. It is unknown why the California District of the Forest Service did not approve of tower heights in excess of 30 feet for live-in cabs. Such towers were available, and in the late 1930s the Washington Office of the Forest Service even published standard lookout tower plans for structures reaching as high as 120 feet with platforms designed to support 196 square foot cabs.

As for the residences that accompanied the Aermotor Company towers, District 5 had two standard designs: the BC-101 plan and the BC-201 plan. The former was a rectangular, single story wood frame building that was divided into three rooms: bedroom, kitchen and office. The 540 square foot house was erected at only a few locations. Conversely, the BC-201 design found its way to many detection sites.

The 570 square foot, single story wood frame building featured a "wing pattern" floor plan, i.e. the bedroom and porch ends of the house were approximately 4.5' narrower than the central kitchen/office area (14'5" width at the ends versus 19' central width; the building was 29'6" long). A most unique attribute was the incorporation of 4/4 fixed pane and casement type windows across the three walls of the bedroom. This large glassed-in area was useful when these buildings were erected at secondary detection points. Observation towers were not erected at secondary sites due to the restricted nature of the detection point's seen area

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(generally less than 180 degrees). The house would be orientated so that the bedroom area (where the firefinder was installed) faced the coverage area. Secondary lookouts were deposited on the edge of steep canyons, peering into the blind spots of the primary detection system. This guaranteed meeting the 15 minute discovery time criteria.

Then there were the ECW live-in cabs. The old 4A design was revised into a 196 square foot building and codified as Plan Number BC-301. These little buildings were erected upon the vast majority of California's hills and mountains. The cab could be placed directly upon concrete piers ("ground cabs") or on towers up to 30 feet in height. There were five basic tower types: L-101, L-401, L-601, L-701 and L-801. The L-101 was a 10 to 12 foot tall, non-battered enclosed timber tower. The corner posts consisted of 8" square or larger timbers. Tower caps (cab stringers) were 10" square. Variations of this design reached to 30 feet in height (ground to catwalk).

The L-401 was a 20 foot nonbattered, open steel H-brace tower. Corner posts were 6"x12"x20' I-beams. The L-801 was a 30 foot battered, open steel (galvanized angle-iron) K-brace tower. Both tower types were in great demand owing to their expected ease of maintenance and predicted longevity. Steel towers, though, were in short supply and the Forest Service ended up with the lion's share.

By far the most common tower types erected were the L-601 and L-701 designs. These were 30 foot and 20 foot (respectively) battered, enclosed timber towers. Their corner posts were from 8" to 10" square or larger and tower caps were 10" to 12" square. Because of their resemblance to the famous grist mills of Holland (minus the blades), these lookout buildings were nicknamed "Dutch Windmills." There were two other tower types which saw very limited use: the L-301 and the L-501. Similar to the enclosed timber towers, these towers had exposed (open) infrastructures, i.e. no siding over the tower legs. The L-301 was a nonbattered, open timber tower to 20 feet and the L-501 was a battered, open timber tower to 30 feet.

In 1937, the Forest Service (Washington Office) published a booklet on tower designs. In this they codified the Aermotor Company towers as the L-1400 series plans. The towers were designed in 45, 60, 80, 100 and 120 foot increments. The steel K-brace towers were codified as the Forest Service's L-1600 series. These came in 10, 20, 30, 41, 54, 67, 83, 100 and 120 foot increments. In passing, it can be mentioned that the first K-brace tower erected in California to exceed the 30 foot height restriction occurred within the Plumas Nation Forest in 1949 upon Big Bar Mountain. The 54 foot tall tower still stands.

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After World War Two, the Forest Service adopted the use of a 169 square foot, all steel cab. The building was topped with a flat, corrugated metal roof (an interesting idea considering the snow loading most lookouts experience during the winter season). A number of the utilitarian cabs, perched upon L-1600 series towers have replaced vintage lookout facilities.

The California Division of Forestry launched their own lookout design program after 1945. Perhaps the most commodious fire lookout design ever penned is CDF's 809R planning series. These were 20 and 30 foot towers which had a nonbattered, steel K-brace infrastructure enclosed by a stand wood frame tower (2" by 4" framing). Siding was originally "v" groove rustic, later 809R plans specified corrugated aluminum. The cabs appeared integral to the tower but the K-bracing did stop at the cab floor. The 809R cab was most attractive in that the windows cut the diagonals thus forming an octagonal window pattern. The roofs maintained the 8-sided motif giving the 809R a highly unique appearance. Yet another atypical characteristic was that the floor plan had enlarged the standard 14'x14' to 16'x16'. In the end, though, these structures proved costly to build and were often subject to chronic water leakage during inclement weather.

As a result, when CDF Region Two (the Sacramento Valley area north to the Oregon line) decided to undertake an extensive fire lookout replacement program, they began work on their own design. CDF Engineer, Mike Plesha, proposed a "pre-fabricated" live-in lookout cab. Plesha's idea was to design a cab that could be fabricated during the winter months and then disassembled, transported and reassembled on site at the beginning of the fire season. This modular construction technique was aimed at minimizing the amount of time spent on a given mountain top. The idea really wasn't unique, all the ECW lookouts were, in essence, prefabricated buildings. Each wildland fire protection agency had specified which of the standard type(s) they needed and the Forest Service then forwarded the orders to the mills and factories. The structures were shipped out as "kits" to be erected by CCC crews on-site.

When Plesha reintroduced the idea, his superiors in Sacramento were skeptical; therefore, they instructed that a prototype be tested first. So, in 1966, a 67 square foot cab was installed upon Likely Mountain. Its success is evidenced by the fact that from 1969 to 1990 a total of 23 "Plesha" cabs have been installed. As for tower designs, Plesha is responsible for three types. First he introduced (in 1972) a 10' nonbattered, enclosed steel tower. It featured 12" columns for corner posts and corrugated aluminum siding. In 1977, he introduced a similar tower using I-beam corner posts. His last design was a nonbattered, open steel H-brace tower. These structures were of much heavier steel construction than the old L-401 towers of the CCC era. Their legs consist of 9" square

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columns. These 30 foot and taller structures were topped with Plesha cabs but they also incorporate a room directly below the cab for the sheltering of water system equipment and bathroom facilities.

Which leads me back to the subject of lookout operators, specifically, their "creature comforts" and technical equipment. As for the latter, map boards and alidades were used, and after 1933 the Osborne firefinder, for determining the location of fires. In essence, the area around the lookout is divided into 360 degree increments. By rotating the alidade (on the map board or firefinder), the lookout operator could obtain a "reading" on the smoke and report the same to the dispatchers. With two or more readings from adjacent stations the fire's location could then be pinpointed (i.e. triangulated). Other technical equipment includes binoculars and scopes, and communication equipment. Originally, information on fires was sent via magneto (crank type) telephones, after World War Two, two-way radios became common.

Prior to the 1950s, lookouts came equipped with wood stoves for heating and cooking, and ice boxes for food storage. (Occasionally, lookouts resorted to storing perishables in nearby snow banks.) Starting in the 1950s, propane (butane) appliances began to appear. Today it's rare to find an old "shepherd" stove, and while propane appliance still proliferate, many stations now boast of modern electric equipment. Since the late 1950s, a growing number of mountain tops have seen the introduction of commercial electric power because of the invention of remote broadcasting facilities, commercial repeaters and microwave equipment. This trend has become most pronounced within the past decade. The conversion of California's peaks into electronic pincushions has often not only been to the detriment of the historic ambiance of the lookout station but has also impaired the lookout's visibility.

Building, health and safety standards have been adopted over the years which influence today's structure designs. In the late 1950s, CDF began installing catwalks around the cabs resting upon the Aermotor Company towers. This retro-fit is apparently unique to California. In the late 1960s, the California Division of Industrial Safety instructed CDF to inspect all lookout tower catwalks for compliance with the minimum 42" high handrail. Many lookouts did not meet this, thus a number of guardrails were either replaced or modified. At about this time, it was directed that wooden fire escape ladders be replaced with all steel materials. In the early 1970s, Cal-OSHA addressed the need to reconfigure lookout stairways into acceptable angles of ascent. This translated into the replacement of many a tower staircase. And, finally, in the "good old days" a lookout had an outhouse (or pit toilet if you prefer), wash tub and hand-pump/water storage system (if lucky) for life's little pleasures. Today, most of the CDF&FP lookout stations are

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completely modernized with pressurized water systems, flush toilets, showers and hot water tanks.

NOTES:

- 1: "Protection of Forest From Fire" by Henry S. Graves, Forester. USDA Bulletin 82. 1910.
- 2: Ninth Biennial Report State Board of Forestry. M. B. Pratt, State Forester. Sacramento. 1922, pg. 47.
- 3: Ibid.
- 4: "Report to Director Natural Resources" M. B. Pratt, State Forester. January 18, 1935. Sacramento.
- 5: Graves. op cit.
- 6: "Early Day Experiences in the U.S. Forest Service" by Robert Harvey Abbey, Forest Ranger: California District.
- 7: "Buildings: Series No. 4." District Forester, Coert duBois. San Francisco: USDA, Forest Service, 1917.